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Filed : **24 October 2003**

The ISR explains that a Category "A" document is one "defining the general state of the art which is not considered to be of particular relevance." Applicants respectfully point out that the initialed copy of the December 24, 2005 IDS indicates that the Office considered the ISR, and thus the Office appears to be aware of the relevance of the Biovector reference as explained on page 2 of the ISR.

Therefore, since the Office has received and considered an explanation of the relevance of the Biovector reference, Applicants respectfully request that the Office reconsider its position regarding the IDS filed on December 24, 2005 and provide an initialed copy of that IDS to Applicants indicating that all of the references have been considered.

Claim Rejections - 35 U.S.C. § 112

Claim 5 has been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The Office has taken the position that the term "weight average molecular weight" is unclear. Applicants respectfully traverse this rejection. The meaning of the term "weight average molecular weight" is well known to those skilled in the art as evidenced by the following excerpt from a standard polymer textbook:

2.7. MOLECULAR WEIGHT AND DISTRIBUTION

Most polymer samples contain a broad distribution of molecular weight species as a result of either the random nature of initiation, termination, and transfer processes in chain-growth polymerization reactions or the random interreaction of species of all sizes which often occurs in step growth polymerization reactions. The polymer sample cannot then be characterized by a single molecular weight, but instead, various molecular weight averages are defined according to Equation (2-11). In this expression, N_i is the number of molecules of molecular weight M_i.

$$\bar{M}_n = \Sigma_i N_i M_i^a / \Sigma_i N_i M_i^{a-1} \qquad (2\text{-}11)$$

When $k = 1$, Equation (2-11) defines the number average molecular weight, $\overline{M}_n$. The number average molecular weight is the arithmetic mean molecular weight of the sample because $\sum_i N_i M_i$ is the weight of the sample and $\sum_i N_i$ is the total number of molecules. When $k = 2$, Equation (2-10) defines the weight average molecular weight, $\overline{M}_w$, so designated because M_i is now multiplied by the weight of molecules in that size class. These two equations can also be represented as $\overline{M}_n = \sum_i n_i M_i$ and $\overline{M}_w = \sum_i w_i M_i$, respectively, where n_i and w_i are the number and weight fraction of molecules of molecular weight M_i. Various other molecular weight averages can be defined, but the special significance of $\overline{M}_n$ and $\overline{M}_w$ are that they can be determined by the commonly used absolute molecular weight methods.

See R.W. Lenz, "Organic Chemistry of Synthetic High Polymers," Interscience, New York, 1967, pp. 48-49 (copy enclosed). Therefore, because the term "weight average molecular weight" is clear to those skilled in the art, Applicants respectfully request reconsideration and withdrawal of this rejection.

Double Patenting

Claims 1-20 have been rejected on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over Claims 1-7 and 12-20 of U.S. Patent No. 6,878,374 in view of U.S. Patent No. 6,379,966. Applicants respectfully disagree, but include herewith a terminal disclaimer to obviate this rejection. A terminal disclaimer submitted in this application is not an admission of the propriety of the rejection. *See* M.P.E.P. § 804.02; *see also Quad Environmental Technologies Corp. v. Union Sanitary District*, 946 F.2d 870 (Fed. Cir. 1991) (noting that "the filing of a terminal disclaimer simply serves the statutory function of removing the rejection of double patenting, and raises neither presumption nor estoppel on the merits of the rejection.").

Conclusion

Applicants respectfully submit that this application is in condition for allowance, early notification of which would be appreciated. The Examiner is respectfully invited to contact the undersigned with any questions regarding this application.

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Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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Organic Chemistry of Synthetic High Polymers

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of two contributions: (*1*) the entropy increase due to the volume increase on melting and (*2*) the gain in conformational entropy. The volume contribution is substantial and complicates any attempt to formulate a simple structural correlation of the ΔS_m values.

2.7. MOLECULAR WEIGHT AND DISTRIBUTION

Most polymer samples contain a broad distribution of molecular weight species as a result of either the random nature of initiation, termination, and transfer processes in chain-growth polymerization reactions or the random interreaction of species of all sizes which often occurs in step growth polymerization reactions. The polymer sample cannot then be characterized by a single molecular weight, but instead, various molecular weight averages are defined according to Equation (2-11). In this expression, N_i is the number of molecules of molecular weight M_i.

$$\overline{M}_k = \sum_i N_i M_i^k / \sum_i N_i M_i^{k-1} \tag{2-11}$$

When $k = 1$, Equation (2-11) defines the number average molecular weight, $\overline{M}_n$. The number average molecular weight is the arithmetic mean molecular weight of the sample because $\sum_i N_i M_i$ is the weight of the sample and $\sum_i N_i$ is the total number of molecules. When $k = 2$, Equation (2-10) defines the weight average molecular weight, $\overline{M}_w$, so designated because M_i is now multiplied by the weight of molecules in that size class. These two equations can also be represented as $M_n = \sum_i n_i M_i$ and $\overline{M}_w = \sum_i w_i M_i$, respectively, where n_i and w_i are the number and weight fraction of molecules of molecular weight M_i. Various other molecular weight averages can be defined, but the special significance of $\overline{M}_n$ and $\overline{M}_w$ are that they can be determined by the commonly used absolute molecular weight methods.

The ratio $\overline{M}_w/\overline{M}_n$, or more appropriately, $\overline{M}_w/\overline{M}_n - 1$, is frequently used as an index of heterogeneity of the molecular weight distribution of a polymer. The value of the latter ratio is zero for a monodisperse polymer for which $\overline{M}_w = \overline{M}_n$, and the value increases with an increase in the breadth of the distribution.

The molecular weight distribution in a step-growth polymerization reaction in which all functional groups have equal probability of reacting has been termed the most probable distribution. In this case, $\overline{M}_w/\overline{M}_n = 2$. This type of distribution also occurs in a number of other processes, such as in the random scission of an infinite molecular weight polymer chain, in random interchange reactions of polymer molecules which can undergo equilibrium reactions, such as ester interchange or amide interchange, and at low conversions in chain-growth polymerization reactions either when

chain transfer is the dominant polymer chain terminating mechanism or when polymer radicals terminate by disproportion.

When termination occurs exclusively by combination of two growing polymer radicals in chain growth polymerization, $\overline{M}_w/\overline{M}_n = 1.5$ at low conversions. With increasing conversion the molecular weight distribution broadens and $\overline{M}_w/\overline{M}_n$ for most free-radical polymers is usually greater than 3 and sometimes as high as 5. When branching reactions become important, commonly by chain transfer to polymer, the highly branched polymer species gain increased capacity for growth and the distribution rapidly broadens with the progress of the reaction. One of the most important examples of this behavior is found in the preparation of high pressure polyethylene in which the $\overline{M}_w/\overline{M}_n$ ratio may exceed 25. Extremely broad distributions also may occur in reactions which undergo autoacceleration due to suppression of the termination step, as for example when the gel effect becomes important in the polymerization of methyl methacrylate. Heterogeneous polymerization reactions obtained with Ziegler catalysts and other surface catalysts also lead to unusually broad distributions for reasons which are still not completely understood. On the other hand, polymers with especially narrow distribution may be prepared under special conditions by anionic or emulsion polymerization or by fractionation.

REFERENCES

1. P. J. Flory, *Principles of Polymer Chemistry*, Cornell University Press, Ithaca, New York, 1953, Chapters 10 and 11.
2. M. Kurata and W. H. Stockmayer, *Fortschr. Hochpolymer Forsch*, 3, 139 (1963).
3. P. J. Flory, ref. 1, p. 402.
4. W. J. Taylor, *J. Chem. Phys.*, 16, 257 (1948).
5. P. J. Flory, ref. 1, Chapter 11.
6. L. R. G. Treloar, *The Physics of Rubber Elasticity*, Oxford University Press, London, 1958.
7. R. L. Anthony, R. H. Caston, and E. Guth, *J. Phys. Chem.*, 46, 826 (1942).
8. P. Meares, *Polymers: Structure and Bulk Properties*, Van Nostrand, New York, 1965, p. 175.
9. A. V. Tobolsky, *Properties and Structure of Polymers*, Wiley, New York, 1960.
10. L. E. Nielsen, *Mechanical Properties of Polymers*, Reinhold, New York, 1962.
11. A. V. Tobolsky, ref. 9, pp. 73, 75.
12. M. C. Shen and A. Eisenberg, in *Progr. Solid State Chem.*, 3 (1966).
13. R. F. Boyer, *Rubber Chem. Technol.* 36, 1303 (1963).
14. L. E. Nielsen, ref. 10, p. 90.
15. E. Catsiff and A. V. Tobolsky, *J. Colloid Sci.*, 10, 375 (1955); *J. Polymer Sci.*, 19, 111 (1956).
16. J. D. Ferry, *Viscoelastic Properties of Polymers*, Wiley, New York, 1961.
17. A. J. Kovacs, *J. Polymer Sci.*, 30, 131 (1958).
18. T. G Fox and P. J. Flory, *J. Phys. Chem.*, 55, 221 (1951).